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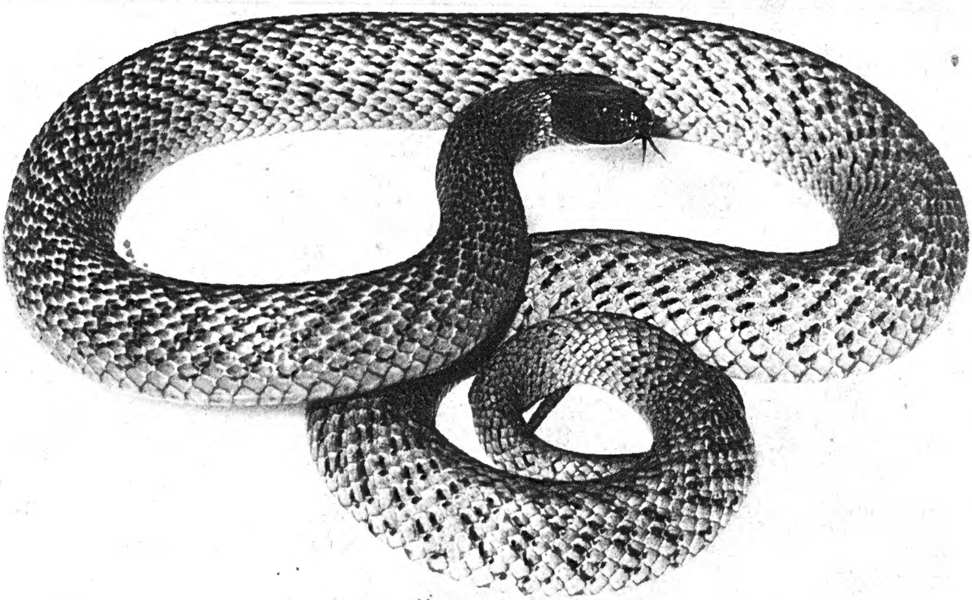

THE SMALL — SCALED SNAKE, *Oxyuranus microlepidotus* (McCoy 1879) was known from only a handful of museum specimens until the 1970s and was, for many years treated as a western form of the Taipan (*Oxyuranus scutellatus*).

In 1975 live specimens were collected and "milked" for the first time. The venom of *O. microlepidotus* is the most toxic terrestrial snake venom known. It is approximately twice as toxic as that of the Common Brown; four times as toxic as that of the Taipan; and nine times as toxic as that of the Tiger Snake.

The Small—scaled Snake has variously been treated as one of the Brown Snakes *(Pseudonaja spp.)*, one of the Blacks *(Pseudechis spp.)* and as a synonym of *O. scutellatus*, the Taipan. Recent work has shown that it is specifically distinct from the Taipan but the two species are congeneric.

—Photograph and caption — Jeanette Covacevich.

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THE EFFECT OF FIRE ON LIZARD COMMUNITIES IN CENTRAL AUSTRALIA.

Greg Fyfe, 1 Grandison Grove, Oak Park, Victoria. 3046.

ABSTRACT

A comparison of the lizard communities present in burnt and unburnt sandhill habitats was undertaken to determine the importance of fire as a modifying factor. Pit traps were used to capture lizard species present in each community. The species found were divided into four groups according to their usual sheltering habits. Group 1 are habitual burrowers, group 2 are shelter/burrowers, group 3 are ground litter shelterers and group 4 are arboreal. The reasons for mortality or survivorship in each group are discussed. Results indicate that group 3 species suffer the highest mortalities in fires.

INTRODUCTION

During the summers of 1979 and 1980, lizards were surveyed from burnt and unburnt sandhill habitats at Ayers Rock, Northern Territory (Lat 25° 15′ S, Long 131°E).The major study objective was to determine to what extent reptile community structure can be modified by fire.

The ecological effects of fire on plant and animal populations are poorly understood (Western Australian Wildlife Authority 1975; Northern Territory Reserves Board 1977). The effects of fire on reptile populations in Central Australia are particularly important as reptiles are the dominant terrestrial vertebrate life form in the arid zone.

Three types of fire are currently recognised in the arid zone (N.T.R.B. 1977). *Low fire:* Where ground litter and grasses are scorched. *Moderate fire:* In which grasses and other plants to 2.5m are burnt completely. Larger trees exhibit trunk burning, but crowns are untouched. *Hot Fire:* Where all plants are burnt. Crowns of tall trees such as Desert Oaks are burnt. A further definition states that *Wildfires* are those fires which cannot be contained or directed.

THE STUDY AREA

Two study sites were selected from a sandhill, situated approximately 4km E.S.E. from the eastern tip of Ayers Rock, made up of quaternary sands of the Simpson land system. (Hooper et al, 1973).

The two study sites were 400m apart, separated by a formed road. During a moderate-hot wildfire in daylight hours in November 1976, this road acted as a fire break so that although the northern side of the sandhill was completely burnt, the area on the southern side was unaffected. At each site, the area included as study area was 400sq.m. Figure 1 illustrates study area dimensions and pit trap placement.

In both study areas the overstorey vegetation was comprised solely of Desert Oak *(Casuarina decaisneana)* up to 6m high, but in contrast significant understorey differences were apparent between the burnt and unburnt sites. The area understorey consisted of a ground cover layer of mixed grasses with dominant *Aristida browniana* (40cm high and 20cm in diameter) and immature *Triodia pungens* (30cm high and 30cm diameter). Scattered over the area were small shrubs, (30-120cm high, such as *Rulingia spp.* and *Grevillea eriostachya.* Percentage ground cover on this site was estimated at 35%.

The shrub layer in the unburnt area was extensive. Abundant shrub species included *Eremophila gibsonii, Grevillea eriostachya,* and *Acacia ligulata.* The greatest apparent difference between the study sites was in ground cover. The unburnt site was dominated by clumps of mature *Triodia pungens* which comprised some 65% of

the ground cover. There was little other ground cover apparent in the clump interspaces. Scattered over the site were small groups of grasses, mainly *Aristida browniana* and a low bush *Helichrysium ambiquum.* The total percentage ground cover on the unburnt site was estimated to be 65%. Figure 2 shows photographs of both sites. Appendix 1 lists all plant species identified from each site.

The climate of the region falls within the arid classification of Meigs (1953). The average rainfall is said to be 150mm per annum, with a summer peak (Hooper et al. 1973). Since 1974 the average rainfall per annum has been well exceeded, however for the duration of this survey little rain was recorded. Air temperatures during summer often exceed 38°C during the day and seldom fall below 18°C at night.

FIGURE 1

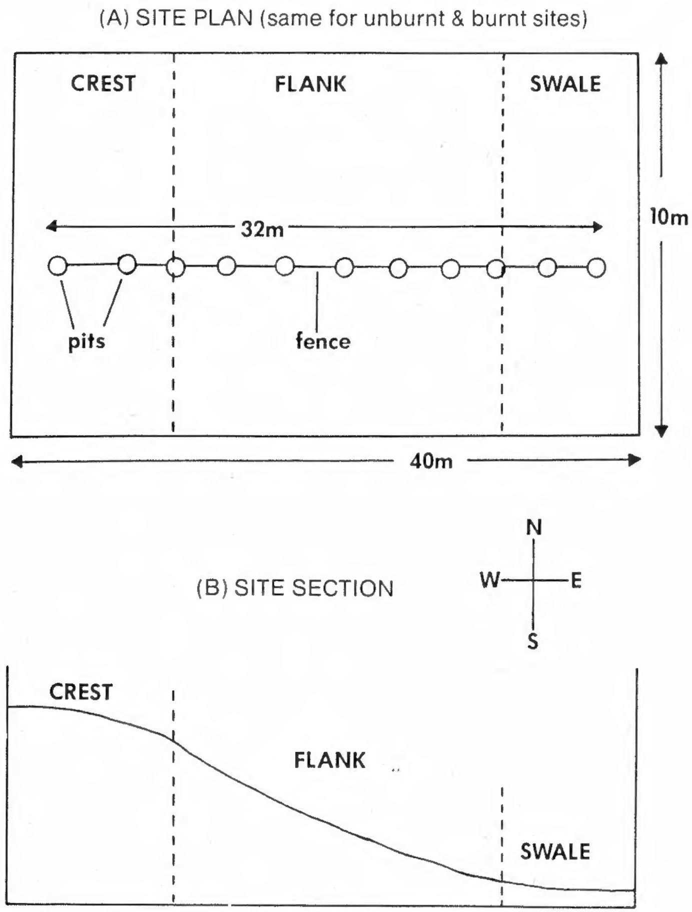
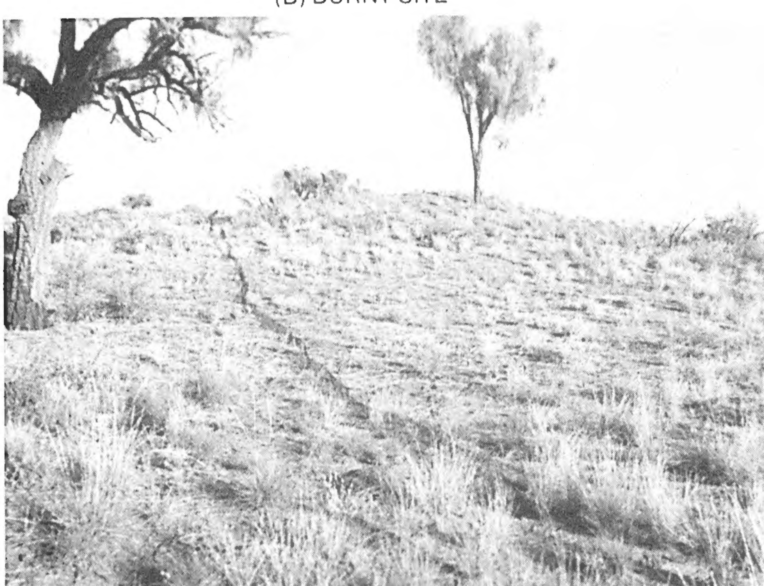


FIGURE 2

(A) UNBURNT SITE

(B) BURNT SITE



MATERIALS AND METHOD

Pit traps in conjunction with drift fences were used to capture lizards on each study site. Every lizard caught in the pits was recorded, marked and released at the capture site. The marking method involved clipping off toes sequentially for individuals of each species. As a general survey technique, pit trap collecting has predictable limitations. Pit traps depend on animal movements on the ground surface, but some species have restricted home ranges, are cryptozoic or aboreal, and would seldom encounter pits. Other species such as Varanids, may be large enough to jump or climb out of all but very deep pits.

The pits were made from bulk flour tins and were 37cm deep and 28cm in diameter. Each drift fence was 32m long, made from 20cm wide PVC cloth and supported by wire stakes spaced approximately 1m apart. There were 11 pits evenly spaced along each drift fence. Both fences began on the dune crest and ran down the eastern dune flanks to the swale area below. Fig. 1 gives a study site sketch plan.

The study period was 81 days (Jan.17 — March 17, 1979 and Feb. 21 — March 12, 1980). Traps were checked three times daily; morning, noon and sunset.

No attempt was made to capture lizards by any method other than pit trapping, however active individuals observed in the study areas were identified where possible and included in the species and diversity tables.

Spotlighting after sunset with a hand held torch was attempted on 18 occasions and some animals were identified by this method. Because the study sites were within a national park, it was not possible to examine potential sheltering sites due to the destructive nature of such activities

The Simpson Index of Diversity was the method used to calculate species diversity for each study site.

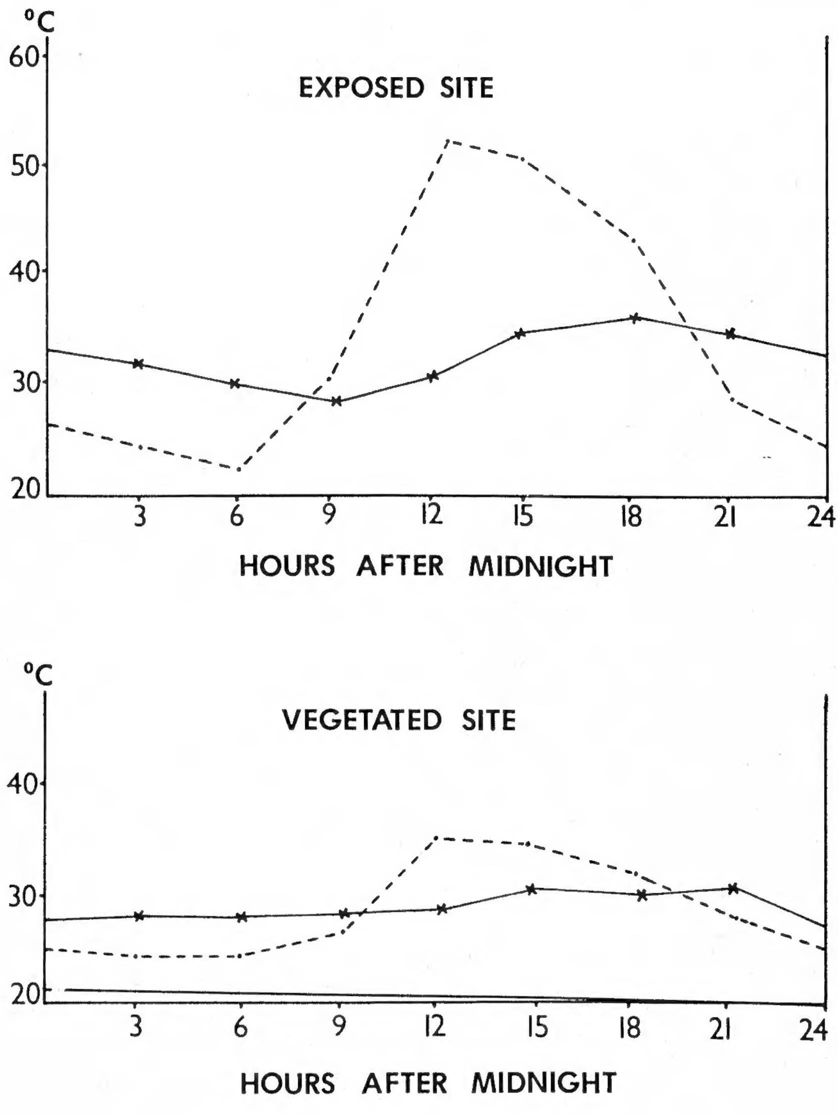
RESULTS AND DISCUSSION

Reptiles inhabiting desert regions avoid heat and related stresses by the adoption of certain behaviour patterns. Heatwole (1976) suggests that there are two main methods of solving the heat stress problem in terrestrial desert lizards. The animal can construct or utilise a burrow, which has a cooler and moistier micro-climate or alternatively, the animal can make use of available surface shade from surrounding vegetation or rocks.

Because soil surface temperatures can far exceed air temperatures during hot summer days, burrowing lizards must burrow deeply to reach heat relief levels. Figure 3 shows how surface and sub surface temperatures vary in exposed and vegetated sites. It is significant that at both levels the vegetated site is much cooler than the exposed site, showing that where cover is present lizards do not need to burrow quite so deeply to reach heat relief levels.

Table 1 lists all lizard species recorded during the survey. Numbers caught and relative densities for each species are provided for each study site. The relative density figures are useful for comparing the species abundance between the two study areas. The species listed in Table 1 have been placed into four groups according to their usual sheltering method

FIGURE 3



———— 180mm deep
– – – – Surface

Means, November 1978
Adapted from Fannin, 1979

TABLE 1

SPECIES/GROUPS	UNBURNT SITE		BURNT SITE	
	Nos	Rel D	Nos	Rel D
Group 1 Burrowers				
Nephrurus laevissimus (Knob-Tailed Gecko)	16	16.3	5	9.4
N. levis (Knob -Tailed Gecko)	3	3.0	1	1.9
Lerista bipes	7	7.1	9	17.0
L. xanthura	1	1.0	—	—
Eremiascincus fasciolatus (Sand Swimmer)	6	6.1	4	7.5
Amphibolurus nuchalis (Central Netted Dragon)	1	1.0	2	3.7
Diporiphora winneckei	6	6.1	1	1.9
Varanus gouldii flavirufus (Sand Goanna)	—	—	1	1.9
Group 2 Shelter/burrowers				
Diplodactylus conspicillatus (Fat-Tailed Gecko)	1	1.0	—	—
Ctenotus brooksi	—	—	1	1.9
C. colleti	2	2.0	2	3.7
C. dux	6	6.1	2	3.7
C.leae	1	1.0	6	11.3
C.pantherinus	3	3.0	—	—
C. piankai	—	—	1	1.9
C. quattourdecimlineatus	21	21.4	12	22.6
Menetia greyi	—	—	1	1.9
Amphibolurus isolepis (Military Dragon)	12	12.2	2	3.7
Group 3 Litter shelterers				
Diplodactylus ciliaris (Spiny-Tailed Gecko)	3	3.0	—	—
D. Stenodactylus	1	1.0	3	5.6
Delma borea	2	2.0	—	—
D. nasuta	1	1.0	—	—
Tiliqua branchialis	2	2.0	—	—
T. multifasciata (Centralian Bluetongue)	2	2.0	—	—
Group 4 Arboreal				
Varanus tristis (Black Headed Goanna)	1	1.0	—	—

Relative Density: (% of total number of specimens of all species on site).
of all species on site.

Group 1: species that habitually burrow or "swim" beneath the sand surface. Burrowing sites are selected in areas that range from heavily vegetated surfaces to bare ground. Members of this group occurred on both study sites but overall they represent a higher ratio of the lizard population on the burnt site. These results indicate a relatively high fire survivorship for most species that retreat underground when threatened.

Group 2: species that shelter in burrows generally closely associated with vegetation. They usually construct their own shallow burrow but occasionally shelter in the abandoned burrows of other species. The highest burrow concentrations are apparent in the pedestal area of *Triodia* tussocks, indicating a general preference for shaded burrow sites. In a fire *Triodia* burns fiercely, but trial burns confirm that many individuals that shelter in pedestal burrows do survive (Gillam pers. comm.). When threatened by fire, some species seek burrow refuges, whilst others resort to speed and attempt to outrun the danger. Immediately after a fire it could be expected that the site would contain some survivors of burrow sheltering species but no individuals of the fleeing species. On the two study sites, burrow sheltering species such as *Ctenotus spp* occur on both areas, whereas fleeing species such as *Amphibolurus isolepis* occurred mainly on the unburnt area, only juveniles of this species occurring on the burnt area. This indicates slow successful recolonisation of burnt sites by "deserter" species

Group 3: species that shelter beneath available ground litter and vegetation. Most ground litter burns and fire mortalities are high for this group whose members, in general,are too slow to outrun a significant blaze. Only one sheltering species was found on the burnt site, all others being confined to the unburnt area.

Group 4: consists of those species which are arboreal in habit. Members of this group generally shelter under loose bark or in hollow limbs. Although suitable habitat for these species occurred on both sites only one observation was made during the survey. A specimen of *Varanus tristis* was seen on the unburnt site. Only hot fires are going to affect this group, survivorship being high in low or moderate fires.

Twelve species of lizard occurred on both sites. Of that twelve, six species belong to group 1. The relative density figures from Table 1 for these six species show that for the two gecko species *Nephrurus spp* and the dragon *Diporiphora winneckei,* the unburnt site had higher abundance while the three species *Eremiascincus fasciolatus, Lerista bipes* and *Amphibolurus nuchalis* were more abundant on the burnt site. The apparent discrepancy here can be explained by considering that the unburnt site has higher populations of all species due to the thicker vegetation. Additionally, arthropods collected from the pits, over a 21 day period, indicate greater arthropod species diversity and overall higher numbers on the unburnt site. I recorded 26 species (95 animals) of arthropod from the unburnt site as compared to 17 species (53 animals) on the burnt site. As a result of ready food availability, it may be that lizards on the unburnt site do not forage widely and hence do not encounter traps as readily. On the sparsely vegetated burnt site it is probable that all lizards forage more widely in their search for food and thus traps are encountered more frequently.

Five of the remaining six shared species, belong to group 2. The species involved are *Ctenotus colleti, C.dux, C.leae, C. quattuordecimlineatus* and *Amphibolurus isolepis.* All are burrow shelterers, but tend to be closely associated with *Triodia* when it is present. The relative density figures for these species show that *Amphibolurus isolepis* and *C. dux* have higher abundance in the well vegetated unburnt site, while the other three species are more abundant on the burnt area. This may reflect a situation similiar to that of the group 1 species, or it may indicate that *C. colleti, C. leae* and *C quattuordecimlineatus* are less dependant on shaded burrow sites than the other two species. Alternatively, it may indicate the operation of some type of competitive exclusion or specific prey preferences. *A. isolepis* invaded the burnt area as an influx of juveniles in the summer of 1980.

The remaining species common to both sites is a member of group 3. *Diplodactylus stenodactylus* is a wide spread gecko, not confined to sandhill habitats. Possibly this species is able to utilise any ground litter or debris. On occasions it has

been recorded sheltering in earth cracks, indicating that animal burrows may constitute a favoured refuge. Cogger (1975) states that this lizard is usually found foraging in open sandy or grassy areas. If that is the case, and the gecko has good fire survival ability or fast recolonisation ability, then the burnt site represents ideal habitat for the species. No other members of group 3 were found on the burnt site, indicating slow recolonisation of the area following the fire.

Table 2 gives a simple index of diversity for the two sites. It is of interest that the species diversities for the two sites are almost equal.

TABLE 2

$$\text{Simpson Index Of Diversity} = 1 - \sum_{i=1}^{S} (Pi)^2$$

D = Diversity
Pi = proportion of individuals of species i
S = the number of species i in the community

Unburnt site	*Burnt site*
D = 1—0. 1076	D = 1—0. 1181
= 0.8924	= 0.8819

Assuming that the fauna of the unburnt area is representative of that which once existed on the burnt site before the fire, it is apparent that the fire has had a considerable effect on the reptile community of the burnt area. The only physical variable between the sites was fire so all differences in reptile, plant and invertebrate community structures must be attributed to that factor.

Because fire has heavy impact on the ground litter sheltering group of lizards, fire management activities in the arid zone should involve the preservation of large areas of mature vegetation. If the fire management plan was of a rotation type, with long periods of 10 to 20 years between burns on any single site, it would create a "patchwork" effect of mature vegetation and burnt areas of different ages. Leaving some areas unburnt for long periods will ensure species diversity and will enable plants and animals to recolonise surrounding burnt areas from the adjacent unburnt refuge areas.

ACKNOWLEDGEMENTS

I wish to thank the Territory Parks and Wildlife Commision for permission to carry out the survey in Uluru National Park. Staff at that park are also thanked for their assistance with the project. Iain Marshall, John Beasy and Paul Cawood, (all T.P.W.C. staff Ayers Rock), are thanked for their assistance in digging 22 holes for pit traps in 44°C heat. Peter Fannin, (also T.P.W.C. Ayers Rock) is thanked for permission to use his unpublished soil temperature data. Finally, I must express my appreciation to Mike Gillam and Ken Johnson, of the Arid Zone Research Institute, who critically read the manuscript, and provided many useful ideas and much enthusiasm throughout the survey period.

APPENDIX 1

Plant Species Identified On Study Sites.

SPECIES	Unburnt site	Burnt site
Trees—		
Casuarina decaisneana	+	+
Shrubs—		
Acacia ligulata	+	+
A.ssp.	−	+
Cassia pleurocarpa	+	+
Codonocarpus cotinifolius	−	+
Dodonaea acuminata	+	−
D.viscosa var. spatulata	−	+
Eremophila gibsonii	+	−
E.wilsii	+	−
Grevillea eriostachya	+	+
G.stenobotrya	+	−
Hakea eyreana	+	−
Rhagodia spinescens	+	−
Rulingia loxophylla	+	+
Thryptomene maisonneuvii	+	−
Ground Cover—		
Aristida browniana	+	+
A.contorta	−	+
Amphipogon caricinus	−	+
Eragrostis eriopoda	−	+
Helichrysium ambiguum	+	−
Triodia pungens	+	+

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OBSERVATIONS ON THE EGGS AND HATCHLINGS OF *EMYDURA KREFFTII* FROM FRASER ISLAND.

Ken McNicol, Dept of Parasitology, University of Queensland.
and
Arthur georges, Dept of Zoology, University of Queensland.

Reports of the nesting of various species of Australian tortoise have appeared from time to time in The Victorian Naturalist (see Goode, 1965, 1966), in its counter parts in the other states and in Herpetofauna. In addition, Goode (1967) and Goode &Russell (1968) described the nesting, natural and artificial incubation and embryological development for *Chelodina longicollis, C.expansa* and *Emydura macquarii* and Vestjens (1969) further reported on aspects of the reproduction of *Chelodina longicollis. Emydura krefftii* and its close relatives, however, have received little attention. The following is an account of observations made on the eggs and hatchlings of *Emydura krefftii* from Fraser Island.

Several adult specimens were captured in Lakes Garawongera and AB on Fraser Island between September 4 and 10, 1979, and were taken to the laboratory for studies of their parasites. They were housed indoors in painted steel tanks containing both tap water and a firm substrate on which to climb. Lighting was provided by Philips TL 40W 55RS "Daylight" fluorescent tubes, augmented for one day in three by an actinic TL 20W 03T fluorescent ultraviolet source. The tortoises were maintained on a diet of live fish, shrimps, minced calf's heart, cat food pellets and occasional newborn mice.

On October 31, 1979, six females were X-rayed using a Phillips mobile 125KVp, 200 MA X-ray machine, to determine if they were gravid (Fig 1). Satisfactory radiographs were obtained with exposures of 0.1 seconds duration with a film focal distance of 90cm and machine settings of 50KVp and 200mA. This resulted in dosages of radiation much less than recommended by other reports (Gibbons & Green, 1979). Two of the six females were found to be gravid; the larger (carapace length;176mm) possessed seven eggs, the smaller (carapace length; 153mm) contained four eggs. Both females were placed in tanks of water and provided with access to sandy soil in which to deposit their eggs. They were then injected with recommended doses of oxytocin-S (Ewart & Legler, 1978) in an attempt to induce egg laying. Palpation during the following three hours revealed that the eggs had moved down the oviducts but egg laying did not occur until 21 days later. It is not known whether the administration of oxytocin affected the dates of egg laying.

On November 22, 1979, the larger female deposited all of her seven eggs in a normally-constructed nest in the sand of her enclosure. The smaller individual laid two of her four eggs in the water eleven days later. The fate of the other two eggs remains obscure. They were either resorbed or were laid in the water and eaten.

Details of the eggs were as follows:

Mean Weight	7.0 grams	(SE=0.1, n=9)
Mean Length	33.1 mm	(SE=0.3)
Mean Width	19.0 mm	(SE=0.2)

They were white, ellipsoid and hard-shelled. The two smallest and lightest eggs were laid by the smaller female. Estimates of egg width taken from the X-rays indicated that the other two eggs of the smaller female were also smaller than any of those of the larger female.

The eggs were placed in an open container of moist vermiculite and kept indoors, where the air temperature ranged between 18°C and 28°C with a mean of about 22°C. Neither the vermiculite, nor the rainwater used to keep it moist, were sterilized but the eggs developed no fungal infections.

Sixty nine days after they were laid, a split appeared in the shell of one of the eggs. Five other hatchlings made similar openings in their eggs, the last appearing on the 74th day. The hatchlings appeared to delay 12—48 hours after first rupturing their shells before emerging completely from the eggs. The final stage of emergence—that of actually leaving the egg was rapid, taking only seconds to complete.

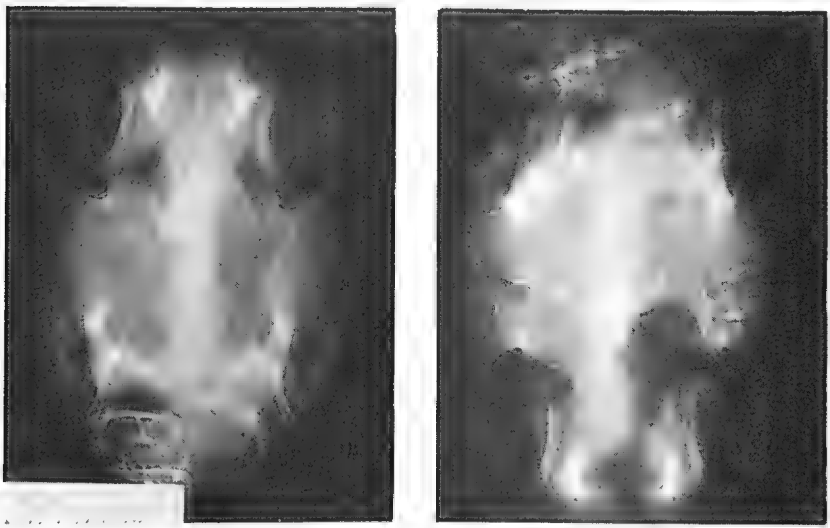

Figure 1. X-ray photographs of two gravid female specimens of *Emydura krefftii* showing clearly the number and position of the eggs.

Five of the hatchlings appeared normal (two possessed minor scute abnormalities). They were extremely active and were able to swim proficiently, though they all showed a marked preference for a dry environment for about 12 hours after hatching. This period may be necessary for the yolk sac to dissociate from the body and for the shell to unfold and become more rigid. The hatchlings showed no inclination to feed for at least 48 hours after emergence, after which they fed voraciously on whole and chopped earthworms.

Only eggs from the larger individual produced any hatchlings; the two eggs of the smaller female that were laid in the water failed to develop. The embryos of two of the eggs of the larger female also failed to survive. Both possessed multiple deformities. One of them reached the stage of opening the egg but was severely malformed, and died without completely emerging. It lacked eyes and a lower jaw, though its nostrils and egg tooth were normal. A tympanum was present only on the left side, and the snout was bent to the right side and upwards. The neck and shoulder region appeared very swollen, giving the unfortunate hatchling an almost cryptodiran appearance. The other embryo was found to be alive but only¾ developed when the egg was opened 16 days after the last of the other hatchlings emerged.

Measurements of the surviving hatchlings were as follows:

Mean Weight	4.6 grams	(SE=0.1, n=5)
Mean Carapace Length	28.8 mm	(SE=0.2)
Mean Carapace Width	25.5 mm	(SE=0.3)
Mean Shell Depth	14.2 mm	(SE=0.2)

Some observations on these normal hatchlings are of possible interest. One hatchling possessed the eye—stripe characteristic of *Emydura krefftii*,while the other four showed no signs of coloration behind the eye, despite the fact that they all arose from a single clutch of eggs. Although the *Emydura* species that inhabits the lakes of Fraser Island almost certainly has close affinities with *Emydura krefftii* from the mainland, the eye—stripe as a feature is highly variable in the Fraser Island populations. Most of the 700 or so individuals examined from the lakes on Fraser Island lacked the eye—stripe; many even lacked the stripe along the lower jaw. Those that possessed the stripe were usually juvenile. This dgree of variation in the eye—stripe both within a single clutch and within populations, soggests that in the genus *Emydura,* the eye—stripe is not a reliable specific character. In other reptile groups, coloration has often proved unreliable when trying to identify individuals to a species

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THE OCCURRENCE OF THE MARBLED VELVET GECKO *OEDURA MARMORATA* (GRAY) IN SOUTH AUSTRALIA.

Brian Miller, 36 Alexander Avenue, Modbury North, S. A. 5092.

The gecko lizard, *Oedura marmorata* is a widely distributed and highly variable species. Its distribution ranges from the northern and central areas of Australia to the eastern States. However, it does not appear to inhabit the north eastern part of Queensland. (Cogger 1975).

The first museum record of this lizard occurring in South Australia came from a single juvenile male specimen, (S.A. Museum. Reg. no. R6101) caught from the Mt McKinlay area in the northern Flinders Ranges, Lat 30° 31′ south, Long 139° 06′ east. This specimen was reported found under the bark of a dead desert oak tree *(Casuarina sp)* by Mr. George Nova, on February 22nd 1965.

To my surprise I was able to capture an adult male specimen of this species whilst on a South Australian Herpetology Group collecting trip in the Northern Flinders Rangers. This specimen, (S.A. Museum Reg. no. R16002) was collected from a rock crevice at the base of Mt. Serle, Lat 30° 32′ south, Long 136° 53′ east, on April 10th 1977. It agrees typically with the species description, except the colouration, which is highly variable in the species.

DESCRIPTION OF THE SPECIES

The head is depressed, large and broad. The body is elongated and very depressed whilst the limbs are moderate with the digits dilated to form a distinctive pad. All the digits are clawed and retractable. "There are four or five pairs of infradigital scale plates under the median toes followed by three or four individual ones". (Boulenger 1885). The head is covered with roundish, homogeneous, flat uniform scales. The rostral and mental shields are somewhat rounded and the labials are larger than those scales in the surrounding area. The dorsal area is covered with a flat, juxtaposed rounded scales larger than those of the head region. The scales on the flanks are smaller while those of the ventral surface are hexagonal. "The tail of southern populations is long, slender and only slightly depressed whereas the northern specimens (Arnhem Land) have tails that are short, greatly depressed, globular and as wide as the body." (Cogger 1975)."Sex may be determined by an examination of the anal region, where the presence of preanal and femoral pores and the enlargement of the post anal area characterises the males. In juveniles, adolescents and in some adults, both these features may be indeterminate". (Cogger 1957).

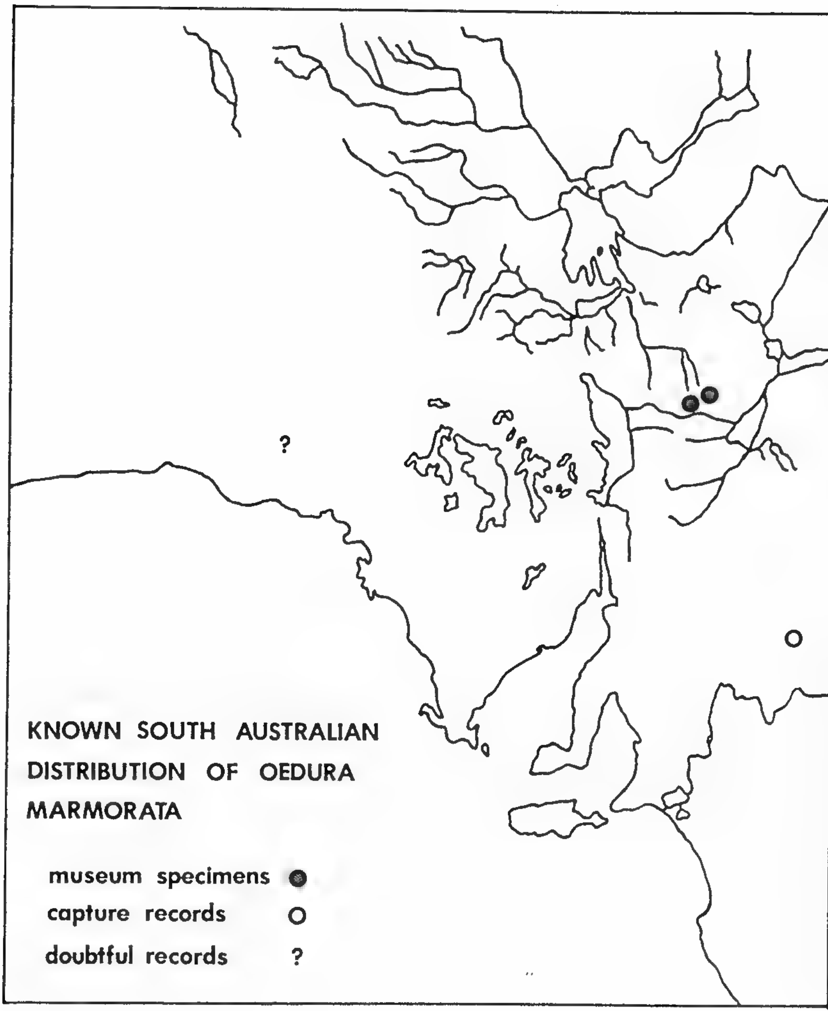
COLOUR DESCRIPTION OF SPECIMEN (R16002)

Brown above with a series of six pale white crossbands lying between the snout and the vent. These crossbands have a dark interior, and are less than half the width of the darker interspaces. The flanks are moderately spotted with yellow and white flecks, while the forelimbs are brown speckled with cream and yellow. The head is scattered with white flecks and a continuous pale stripe exists on the lips. The ventral surface is white and preanal pores are absent in this specimen.

COLOUR DESCRIPTION OF SPECIMEN (R6101)

This specimen has typical juvenile colouration; purplish brown above with well defined white crossbands. A continuous pale white stripe exists on the lips, and the ventral surface is a white colour. There is no indication of alcohol fade.

FIGURE 1


?
KNOWN SOUTH AUSTRALIAN DISTRIBUTION OF OEDURA MARMORATA
museum specimens
capture records
doubtful records ?

MEASUREMENTS OF SPECIMEN (R16002)

Snout—vent: Tip of snout—cloacal opening, 100mm; Tail: Cloacal opening—Tip of tail, 50mm; Foreleg: Axilla— end of longest digit, 28mm; Hindleg: Groin— end of longest digit, 35mm; Length of head: Base of skull— tip of snout, 28mm; Breadth of head at widest points; 19mm; Height of head; 10mm; Overall length: Tip of snout—tip of tail, 150mm

MEASUREMENTS OF SPECIMEN (R6101).

Snout— vent: Tip of snout— cloacal opening, 50mm; Tail: Tip of Tail— cloacal opening, 22mm; Foreleg: Axilla— end of longest digit, 17mm; Hindleg: Groin— end of longest digit, 19mm; Length of head: Base of skull— tip of snout, 17mm; Breadth of head at widest points, 10mm; Height of head, 6mm; Overall length: Tip of snout—tip of tail, 72mm.

DISCUSSION

The late F. J. Mitchell cites in his Arnhem Land report (1964), as having examined two adult male specimens of *Oedura marmorata.* One of these specimens being found at the Bunda Plateau, which lies to the north of Fowlers Bay, Eyre Peninsula, South Australia, and the second specimen coming from Eucla, Western Australia which lies just over the South Australian border.

After searching the South Australian Museum spirit collection, two specimens of *Oedura marmorata* were found (S.A.M. R2040 A—B). Both specimens are recorded as coming from Eucla, Western Australia and the data concerning the capture dates, collector and notes on habitat cannot be found. It is interesting to note that the tails of the two Eucla specimens are depressed, short and moderately globular. This possibly suggests that the specimens may have come from a more northerly area than previously stated and in fact the Eucla location could prove to be erroneous. The specimen from the Bunda Plateau could not be located and its occurrence in that area remains dubious until a further record can be obtained. Due to the age and condition of the two Eucla specimens, colour descriptions could not be obtained as they had grossly faded.

Mr. J. Bredl has informed me that he has caught this species sheltering in the cracked limbs of the desert oak tree *(Casuarina sp)* in the Canopus region, 60kms north of Renmark, South Australia.

With the occurrence of *Oedura* in South Australia there are at present ten genera of Gekkonidae known to inhabit this State. As the habitat of the few specimens collected in South Australia seems so diverse (see Figure 1), it can be expected that the area of its distribution covers a wider range than presently known.

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FURTHER RECORDS OF AGGREGATIONS OF VARIOUS SPECIES OF AUSTRALIAN SNAKES.

Raymond T.Hoser, 60 Arterial Road, St. Ives, 2075.

INTRODUCTION:

Aggregation of numbers of snakes are a common occurrence and well documented in most parts of the world, particularly amongst species of the genus *Crotalus* in the America's where aggregations of over one thousand individuals have been recorded. (Klauber,1972).

Recorded aggregations for Australian species include:

Typlina sp. presumably *nigrescens,* (Blind Snake) Worrell (1970). *Morelia spilotes variegata,* (Carpet Python), Covacevich and Limpus (1973). *Morelia spilotes spilotes,* (Diamond Python), Webber (1978), *Boiga irregularis,* (Brown Tree Snake), Covacevich and Limpus (1973), Gow (1976), *Dendrelaphis punctulatus,* (Green Tree Snake), Kinghorn (1969), McPhee (1979), *Demansia psammophis,* (Yellow—faced Whip Snake) Covacevich and Limpus, (1972), Gow (1976), *Furina diadema,* (Red—naped Snake) McPhee (1979), *Cryptophis nigrescens,* (Small—eyed Snake) Covacevich and Limpus (1973), Gow (1976), *Hemiaspis signata,* (Marsh Snake) Mcphee (1979), and *Pseudechis porphyriacus,* (Red—bellied Black Snake), Kinghorn (1969).

Presented here are recorded occurrences of aggregation in *Typhlina sp.* presumably *nigrescens,* (Blind Snake), *Typhlina wiedii, Morelia spilotes spilotes,* (Diamond python), *Boiga irregularis,* (Brown Tree Snake), *Demansia psammophis, (Yellow-faced Whip Snake), Furina diadema,* (Red—naped Snake), *Cryptophis nigrescens,* (Small—eyed Snake), and *Pseudonaja textilis,* (Eastern Brown Snake). To my knowledge, aggregation in *Typhlina wiedii* and *Pseudonaja textilis,* have never been previously recorded.

In all aggregations the individual snakes found were typical specimens for their species in terms of health, bodily size, colouration and form. In none of the aggregations were the snakes sexed, nor was it determined how recently any of the snakes in the aggregations had fed.

SUMMARY AND DETAILS OF THE AGGREGATIONS.

Aggregation One.

Mr. Craig Bennett and Mr. Alexander Houben whilst carrying out herpetological fieldwork towards the end of January 1978, at Belrose N.S.W. (Lat.33° 45′ S, Long. 151° 15′ E) located a large aggregation of Blind Snakes, (presumably *Typhlina nigrescens*). The area in which the aggregation was found was a dry sandstone ridge with much scrubby vegetation around it, in an area of bushland. The site of the aggregation was three quarters of the way up a hillside. The hillside was described as being moderately steep, with a westerly aspect.

The aggregation was located under a large sandstone rock, roughly square in shape with approximate dimensions of 45cm × 45cm × 10cm deep. The rock was covered with approximately 6cm of leaf litter, and was well shaded by a 2m high christmas bush *(Prostanthera lasianthos).* The rock was located on the top of a 2m cliff, which had scrub above and below it. The soil under the rock was moist and sandy. The aggregation was discovered at midday (local time) and the weather was described as being calm mild and sunny, with the average air temperature probably around 25°C.

The aggregation when found initially, consisted of one large knotted mass of blind snakes under the rock. When the aggregation was disturbed, the blind snakes attempted to escape. Twenty seven specimens were actually caught. It was estimated that approximately eight specimens escaped, so this aggregation consisted of roughly thirty five individuals. The size of the specimens ranged from juvenile to large adult, with a fairly even size distribution.

Aggregation Two.

In January 1976, Mr, Gary Webb located an aggregation of seven Blind Snakes (presumably *Typhlina nigrescens*) in bushland near Glenbrook N.S.W. (lat 33° 46′ S, long 150° 36′ E). The aggregation was located at approximately 5.30 p.m. (local time). The weather conditions at the time were described as hot, windy and sunny with an average air temperature of 30°C. The aggregation was found near a valley floor on the slope of a hill with a westerly aspect. The local habitat was rocky sclerophyll forest. The aggregation was located under a sandstone rock slab, roughly 60cm long ×40cm wide ×10cm deep, which was fairly well embedded on dry, sandy, loamy soil. The rock was not concealed in any manner. There were six juveniles and one adult specimen in a single cluster. Although they tried to escape, all specimens were caught.

Aggregation Three.

On the 18th May 1980, Mr. Richard Llewellyn located an aggregation of three *Typhlina sp.* (presumably *Typhlina nigrescens)* under a sandstone rock at Belrose N.S.W. (lat 33° 45′ S, long 151° 15′ E). The aggregation was located at 1.00p.m. (local time) and the weather conditions were calm, cool and sunny with an average air temperature of 18°C. The three specimens were found in a single coiled mass under a sandstone rock, approximately 60cm × 50cm × 15cm deep. The rock was not particularly well shaded, nor was it very well embedded or concealed in any manner. The soil underneath the rock was dry, sandy soil, and the rock was located adjacent to a medium sized rock outcrop, which was sited downhill. All three specimens attempted to escape when disturbed, but none eluded capture.

Aggregation four.

In November 1978, Mr. Ken Shepperd and Mr. Bill Miles located an aggregation of *Typhlina sp.* (presumably *nigrescens)* at St. Clair N.S.W. (lat 33° 48′ S long 150° 48′ E). The local habitat was dry, open woodland. The weather conditions at the time were described as relatively hot and sunny, with the air temperature somewhere in the vicinity of 30°C. The aggregation was located around midday (local time).

The specimens were located under a log, which was not hollow, approximately .3m thick, and roughly 2m long. The log was described as relatively heavy and firmly placed on the ground in a horizontal position. The soil underneath the log was dry and loamy in composition. The three sub—adult specimens were in a single coiled mass and attempted to escape immediately when disturbed.

Aggregation Five.

On the 30th August 1978, Mr. John Scanlen and the author were undertaking herpetological fieldwork 5kms south of Bell in Queensland (lat 27° 5′ S, long 151° 26′ E) when an aggregation of seven *Typhlina wiedii* was located. The local habitat was relatively flat, open woodland with scattered rock outcrops along a watercourse that traversed the area. The watercourse consisted of a dried up creek bed with some scattered water filled ponds only.

The aggregation was located at 3.00p.m. (local time) and the weather conditions were cool, windy and cloudy, with an average air temperature of below 17°C. There had been light to moderate rainfall in the area on the previous day.

The aggregation was found under a well embedded basalt rock, situated in a dried up section of a creek bed. The rock, not concealed in any manner, was approximately 30cm.× 30cm ×30cm deep. The soil underneath the rock was moist, dense and dark in texture, being a dry silt like soil type. The seven juvenile specimens when initially disturbed were in a single tightly knotted bundle and although they tried to escape when disturbed, none were successful.

Aggregation Six.

In mid November 1974, Mr. Tony Butz, an honorary ranger, located an aggregation of five Diamond Pythons *(Morelia spilotes spliotes)* in bushland adjacent

to the Hawkesbury River N.S.W. (lat 33° 30′ S, long 151° 10′ E). The aggregation, situated in a rocky sclerophyll forest was discovered when fighting a low intensity downhill moving bushfire. The aggregation was located during the afternoon (local time), and the weather conditions were hot, sunny and windy. The five snakes were moving downhill, away from the encroaching bushfire when they were located by Tony Butz and other fire fighters. It is assumed that all five snakes emerged from a large 5m long hollow but only partially enclosed log, as they were all captured adjacent to this log. The snakes were not actually seen emerging although it is thought that excessive smoke, fire or both inside the log may have forced the snakes to flee. The log, a fallen gum tree averaged.75m in diameter. Four snakes were adult, each averaging 2m in total length. The fifth snake was approximately 1m in total length.

Aggregation Seven.

During the mid—winter 1977, whilst undertaking herpetological field work, Mr. Robert Croft, and the author located an aggregation of five Brown Tree Snakes *(Boiga irregularis)* at St. Ives, N.S.W. (lat 33° 43′ S, long 151° 16′ E). The aggregation was discovered at 11.00am. (local time). The weather conditions at the time were cool, calm and sunny, with an average air temperature of 17°C.

The five snakes, in a single cluster were located in a "honeycomb formation" in a cave which had numerous other "honeycomb formations" and crevices. The cave was approximately 1m high × 2m wide × 2m deep. It was part of a long intermittent sandstone rock ridge encircling the top of a hillside in a wet rocky sclerophyll forest. The location where the snakes were discovered had a north—westerly aspect.

The five snakes consisted of two adults,measuring approximately 150cm in total body length, two sub-adults approximately 90cm long and one juvenile roughly 30cm in length. The five snakes were resting when discovered and made no attempt to escape until actually removed from their resting site.

No other snakes were found in the vicinity of this aggregation, although numerous apparently suitable "honeycomb formations" and crevices were present in the cave and the rock outcrop.

Aggregation Eight

During November 1979 Mr. David Cary located an aggregation of four Brown Tree Snakes *(Boiga irregularis)* near Wyong, N.S.W. (lat 33° 15′ S, long 151° 15′ E). The snakes were caught at 10.30 am. and the weather conditions at the time were described as calm, mild and sunny with the air temperature in the vicinity of 24°C. The aggregation was in a sandstone rock outcrop near the top of a hill, with a south easterly aspect. The local habitat was wet, rocky, sclerophyll forest. The four snakes were located in a rock crevice, 6cms high × 3m wide × 2m deep. The four snakes when initially located were resting in a single group. The crevice which held these four snakes was the largest and perhaps the most favourable for snakes on the entire rock outcrop. The snakes only attempted to escape, or move away when poked with a stick. Two of the snakes were adult, one was a sub—adult, and the fourth specimen was a juvenile.

Aggregation Nine.

During July 1977, Mr. Alex Dudley and the author, located an aggregation of five juvenile Yellow—faced Whip Snakes, *(Demansia psammophis)* at Terrey Hills N.S.W. (lat 33° 43′ S, long 151° 17′ E).

The aggregation was in an area of moist rocky sclerophyll forest 200m from a main road. The site was on a hillside with a south—easterly aspect. The aggregation was located at 4.30 pm. (local time) and the weather conditions were calm, cool and cloudy, with an air temperature of approximately 15°C.

The five snakes were found in a single cluster under a small sandstone rock on a secluded rock outcrop. The rock which was well embedded in loose, moist, dark

though sandy soil, measured about 30cm. × 20cm × 10cm deep. The rock was well covered by leaf mould, mosses and lichens and although it was situated on a rock outcrop it was relatively well concealed.

The five snakes when initially disturbed made no attempt to escape. No other snakes were found in the vicinity of this aggregation.

Aggregation Ten.

Mr. Alex Dudley, whilst conducting herpetological fieldwork in mid winter 1978, located an aggregation of five juvenile Yellow—faced Whip Snakes *(Demansia psammophis)* at Kenthurst N.S.W. (lat 33° 38′ S, long 150° 57′ E). The area was dry, rocky, hilly sclerophyll forest and the aggregation was located near the top of a hill with a north—westerly aspect. The snakes were discovered in the early afternoon (local time), with the weather conditions being described as cloudy and cool but not raining.

The five snakes were situated under a sandstone rock in a single cluster, the rock measuring about 60cm × 30cm × 10cm deep. The rock was not very well embedded, and the soil underneath it was dry and sandy. The rock was not concealed in any manner and was sited on top of a well exposed rock ridge. The snakes were in a cool inactive state when discovered.

Aggregation Eleven.

During mid winter 1975, Mr. Garry Webb, located an aggregation of two adult Yellow—faced Whip Snakes *(Demansia psammophis)* and one adult Red—naped Snake *(Furina diadema)* at Glenbrook N.S.W. (lat 33° 46′ S, long 150° 36′ E).

The aggregation was located on top of a hill in dry, rocky sclerophyll forest. The three snakes were discovered at roughly 10.00am. (local time) and the weather conditions were described as being simply cool, dry and mild.

The aggregation was located under a single well embedded sandstone rock measuring approximately 60cm × 90cm × 15cm deep. The soil underneath the rock was dry, sandy and loamy.The rock was not on, or immediately adjacent to any outcrop, simply being sited in an open section of ground in bushland. The three snakes when discovered were coiled up in a group, in a state of apparent torpidity.

Aggregation Twelve.

During early May 1977, the author located an aggregation of twenty nine Small—eyed Snakes *(Cryptophis nigrescens)* at Darkes Forest N.S.W. (lat 34° 11′ S, long 150° 56′ E). The aggregation was discovered at 10.00am. and the weather at the time was cool, calm and sunny, with an average air temperature of around 14°C.

The local habitat was a mixture of sclerophyll forest and farmland and the aggregation was located adjacent to the remains of a demolished house. The remains of the house consisted of a few large slabs of concrete, blocks of wood, sheets of corrugated iron etc., in a partially cleared patch of land. The aggregation was located in a pile of approximately twenty sheets of corrugated iron. The snakes were not all located together, but in clusters ranging from one to four individuals sometimes with more than one cluster between two sheets of corrugated iron. The sheets were positioned directly on top of one another in a tight fitting manner, with only limited amounts of debris between each sheet of tin. The pile of corrugated iron was sitting on moist rich dark soil, typical of the local area. No snakes were located under the bottom sheet of the iron. The regions between each sheet of iron were generally slightly moist, and contained no other snakes besides the twenty nine Small—eyed Snakes. The snakes ranged from juvenile to large adult, with the majority of the snakes being adult. The snakes appeared to be inactive and in a state of hibernation when found.

Aggregation Thirteen

During early winter 1979, Mr. David Cary located an aggregation of eight adult

Small—eyed Snakes *(Cryptophis nigrescens)* at Kangaroo Valley N.S.W. (lat 34° 43′ S, long 150° 33′ E). The aggregation was located at midday and the weather at the time was cold and raining lightly, with an average air temperature of around 15°C.

The aggregation was located half way up a moist, rocky sclerophyll forest hillside with an easterly aspect. The snakes were located underneath a very large well concealed sandstone rock, covered with roughly 9cms of leaf litter. The rock was well shaded by shrubbery and had the approximate dimensions of 120cm × 120cm ×25cm deep. The rock was on fairly dry, loose, sandy soil. Adjacent to the rock was a cliff face roughly 3m high, with the rock being situated on top of the cliff. The eight adult snakes were in a single cluster, and in a state of torpidity when found.

Aggregation Fourteen

In late Autumn 1972, Mr. Garry Webb located a large aggregation of Eastern Brown Snakes *(Pseudonaja textilis)* between Rooty Hill and Mount Druitt N.S.W. (lat 33° 43′ S, long 150° 45′ E). The snakes were located in the late morning (local time) and the weather conditions were described as relatively sunny and mild for that time of year. The habitat in the area consisted of a mixture of open woodland and farmland with flat topography.

The aggregation was located in and around a demolished house, of which the only remnants were large slabs of concrete where the house had initially stood. Little vegetation other than grasses and the occasional tree was in the vicinity of this aggregation. The main part of the aggregation consisted of thirteen Brown Snakes in a single group, coiled up next to one another, underneath a large concrete slab measuring roughly 5m × 3m × .2m deep. With these thirteen snakes, one adult Eastern Blue—tongued Skink *(Tiliqua scincoides)* was found. The slab was moved from its original site in a piecemeal manner. This concrete slab was the largest single piece of cover in the vicinity. Other pieces of ground cover, including smaller concrete slabs, within a radius of 20m, yielded a further seventeen Brown Snakes *(Pseudonaja textilis)* in groups of one to four. All thirty snakes were adult except for two juveniles and were resting when found. Mr. Garry Webb, who has carried out much herpetological fieldwork in the region of Rooty Hill and Mount Druitt N.S.W. over the years has found several smaller aggregations of Brown Snakes *(Pseudonaja textilis)* and Red-bellied Black Snakes *(Pseudechis porphyriacus)* numbering up to 6 individuals under a single piece of cover. These particular aggregations have always been found in the colder months of the year, particularly in early spring.

Aggregation Fifteen.

During late October 1976, Mr. Gary Stephenson located an aggregation of ten Brown Snakes *(Pseudonaja textilis)* near Windsor N.S.W. (lat. 33°35′ S, Long 150° 50′ E). The local habitat was fairly flat in topography. The aggregation was found in mid afternoon (local time) and the weather conditions at the time were described as being cloudy and mild for that time of year, with an air temperature in the vicinity of 24°C. The snakes were located coiled up, in more than one cluster underneath a very large sheet of tin of unknown size. The sheet of tin was slightly embedded into the ground. The aggregation consisted of ten specimens, six juveniles and four adult. Gary Stephenson reports having found numerous smaller spring time aggregations of Eastern Brown Snakes *(Pseudonaja textilis)* in the same area, but the case above is the largest single aggregation found by Gary to date.

DISCUSSION AND CONCLUSIONS.

Reasons for Aggregation.

The reasons for aggregation in snakes are manifold and would almost certainly differ from case to case. With the possible exception of aggregations two, five, nine

and ten, it is unlikely that any of the aggregations resulted from new born snakes failing to move away from their birth or hatching site. It is also unlikely that any of the fifteen documented aggregations arose from high uniform density occupations of one area. *Amphiesma mairii* (Freshwater Snake) has been found to be extremely abundant in moist habitats in South East Queensland (Lyon 1973), (Limpus 1973). *Pseudechis porphyriacus* (Red—bellied Black Snake) has been observed as being extremely common along tracks in closed forests at Danbulla Queensland and Barrington Tops N.S.W. (Limpus 1973). I have found that *Notechis scutatus* (Tiger Snake) and *Austrelaps superba* (Copperhead) are extremely common in certain swampy parts of Southern N.S.W.. Worrell (1970), reports that both *Notechis scutatus* and *Austrelaps superba* can attain very high population densities.

In some of the aggregations documented here it appears that hibernation is not the sole or primary reason for aggregation. These are aggregations one, two, four, six, eight and fifteen, all of which were found during the warmer months of the year. Evidence of aggregation for hibernation purposes is seen in most of the fifteen cases, and it is particularly obvious in the cases where the snakes were found in torpid states. Klauber (1972) postulates that aggregations for hibernation purposes are most prevalent and obvious in cooler regions. This is supported by the significant proportion of the fifteen agregations which were found in colder regions.

Aggregations appear to serve more than one purpose. Mehrtens (1959) provides evidence of much mating activity in an aggregation of Western Diamondback Rattlers *(Crotalus atrox)* which was primarily a hibernation aggregation. The aggregations in the warmer months, or ones centered around spring in many cases probably serve a reproduction function.

Other reasons for aggregation in these documented cases are harder to ascertain. They may include moisture conservation reasons, energy conservation and predator protection (Klauber 1972). These last three reasons for aggregation would lessen the need for the aggregating snakes to be of one species. In only one case documented here, did the aggregation consist of more than one species, namely aggregation eleven. However, numerous other cases of multiple species aggregation have been reported in the past, including Covacavich and Limpus (1973), Klauber (1972).

The reasons for the juvenile and immature snakes aggregating during the warmer months (periods associated with activity) are hard to ascertain. One reason could be that the chances of survival of the individual is larger when it is one of a large group, than when it is on its own. This hypothesis, like most others which endeavour to explain why snakes aggregate is very difficult to test.

Advantages and Disadvantages of Aggregation.

The advantages include protection and conservation of limited resources. The main disadvantage of aggregation is that a calamity may kill many snakes in the aggregation or the entire aggregation might die. Klauber (1972) reports on entire groups or "dens" of rattlesnakes (Genus *Crotalus*), dying due to abnormal or unusual circumstances, such as climatic conditions, or predation by other species including man. Community egg laying species of snakes such as *Demansia pasammophis* (Covacevich and Limpus 1972, McPhee 1979, Scanlen, personal communication) often lay eggs communally for similar reasons to those of aggregating snakes i.e. to gain various advantages. The failure of communally laid eggs to hatch, or the death of all snakes in a single large aggregation could have a catastrophic effect on a local snake population

Aggregation Stimuli and Patterns.

Where aggregation in reptiles has been studied in detail, it has been found that snakes aggregate in response to various stimuli, particularly temperature related stimuli (Klauber 1972). Excluding the cases of aggregation documented for *Typhlops* species, it appears that aggregations in the other snake species follow fairly well

defined seasonal patterns. For example *Pseudonaja textilis* appears to aggregate during the mating season, namely spring. It is possible that the seasonal temperature changes might be the dominant stimulus involved in making many Australian snake species aggregate. Other stimuli may include photo—period length, and other environmental stimuli such as flood or drought.

In North America, it is well known that in many cases, snakes aggregate at the same points year after year, (Klauber 1972, Mehrtens 1959, Wagner 1969). So far there is little if any evidence of this occurring in Australia, although this could be due to the lack of observation and research in this field. In North America it has been found that most winter snake aggregations are sited in places with sunny aspects. In hilly areas this often means being on hillsides facing the equator, (Klauber 1972). From the documented cases in Australia, this trend also appears valid in this country.

Many of the fifteen aggregations tended to be well concealed, a trend also found in other countries (Klauber 1972, Wagner 1969). How a snake seeing at ground level only can determine if a rock or crevice is well concealed relative to other organisms such as man is one area presently lacking in research.

Evidence and records of Aggregation in Snakes in Australia.

As stated by Webber (1978), the recorded occurrence of aggregation in snakes in Australia is only documented for a few species and by remarkably few actual cases. From my own inquiries amongst people who have been involved in herpetology, mainly in the Sydney region, it appears that aggregation in Australian snakes is far more frequent than is widely believed. I believe that most aggregations of snakes found in Australia are not recorded due to the belief that they are not particularly important or significant in herpetological studies. Most records of aggregation in Australian snakes are found in popular published literature, and are generally the author's own personal records. Surely these people are not the only people in Australia who find aggregations of snakes! With the upsurge of herpetological activities in Australia recently, more aggregations of various species of snakes will probably come to light in the near future.

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POTENTIAL PROBLEMS IN ARTIFICIAL INCUBATION OF TURTLE EGGS

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In discussing conservation problems of a population of the fresh water turtle, *Emydura macquarii*, in South Australia, Thompson (1979) suggested the movement of a large number of eggs to artificial nest sites as one of the two possible management solutions. This type of management has had wide application among sea turtle populations. Recent research has highlighted three problems which must be considered in very large scale movement of sea turtle eggs. There is a high probability that these same problems will apply to the movement of eggs of other types of turtles.

First, sea turtle eggs can be killed by movement, even gentle rotation, during the early stages of incubation. During normal incubation of eggs of loggerhead and green sea turtles, there is a critical period which begins several hours after laying, and extends for approximately three weeks, during which gentle inversion of the eggs causes a significant decrease in hatching success. (Limpus *et al*, 1979; Parmenter, in press). The time for the commencement of this critical period is a function of egg temperature and severity of movement (Miller and Limpus, unpublished data). For any planned large scale movement of turtle eggs there is a need to assess the limits of the critical period applicable to that specific movement method and hence to determine when eggs moved with the minimum of rotation and vibration will have a maximum hatching success.

Second, the sex of loggerhead and green sea turtles has been shown to be influenced by the temperature at which the eggs were incubated (Yntema and Mrosovsky, 1979; Limpus and Miller, unpublished data). At about 29°C and above the resulting hatchlings are all females, while at about 26°C the hatchlings are all males. Between these temperatures (the usual incubation temperature range recorded on nesting beaches) a mixture of males and females will be produced.

When a clutch of sea turtle eggs is shifted to an artificial nest site, unless identical temperature regimes apply to both nest sites, there is a high probability that the sex ratio of the clutch will be altered.Eggs incubated only a few degrees cooler than naturally can be expected to produce 100% males. Of the wide range of terrestrial and aquatic species investigated (Yntema, 1979; Pieau, 1975; Bull and Vogt,1979), only the *Trionychidae* have shown sex determination independent of the incubation temperature. The effect of temperature or sexual differentiation of the Australian freshwater turtles *(Chelidae)* has yet to be investigated.

Thirdly, there has been a long debate among sea turtle researchers over the mechanism by which the adult turtle selects its nesting beach. One strongly favoured though unproven theory, is that the hatchling is imprinted to its natal beach, and at maturity in some ways responds to cues, which lead the turtle back to this beach.

A well intentioned conservation programme which involves the movement of sea turtle eggs, can be ineffective, or even detrimental to the sea turtle population, through ignorance of the consequences of the management practices.Because less is known of the biology of Australian chelid turtles than is known of sea turtles, any management programme must account for the potential for killing a large proportion of the eggs during their movement, the potential for producing an all male population by lowering incubation temperatures, and the potential for interfering with future behaviour of the animals, through the consequences of altering the incubation environment.

As a working principal in turtle conservation we recommend that disturbance of eggs should be avoided whenever possible. Where severe predation of turtle eggs occurs (Thompson, 1979) every effort should be made to control the predator by exclusion or removal rather than to choose the probably cheaper but potentially disastrous action of shifting the eggs.

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ACCIDENTAL COMMERCIAL TRANSPORT OF A FROG TO CHRISTMAS ISLAND, INDIAN OCEAN.

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There are no native species of frogs on Christmas Island, Indian Ocean. Furthermore, the remoteness of the island makes it unlikely that amphibians would reach it by natural means. Because of their relatively permeable skins they would be unlikely to survive the conditions of desiccation and salinity encountered during rafting over extensive distances of Ocean. Consequently, any amphibians arriving at Christmas Island would be most likely to be brought by man's agency. In this paper we report such a case.

On the morning of 3rd March 1980, one individual of the frog, *Litoria adelaidensis,* was discovered among cabbages being unloaded from the merchant ship, Cape Hawke, at the settlement on Christmas Island. The frog was 44mm snout to vent. It was alive and apparently healthy (Fig. 1). It had been in a refrigerated hold kept at 1°C ± 0.5°C for a period of at least 5 days and perhaps for several days more, depending upon exactly when the frog was loaded aboard. The vessel which transported it left the port of Albany, Western Australia, on 26th or 27th February, 1980, and arrived at Christmas Island on the 3rd March. No other individuals were encountered during the unloading.

The frog was preserved, and the specimen is now in the Australian National Parks and Wildlife Service collection on Christmas Island.

In response to a letter of enquiry, Mr Z. Sumich informed us: "the cabbages were picked at our own property at Myalup near Harvey, and would have been picked 2—3 days before loading. Normally the cabbages are placed under refrigeration within 3—4 days of picking.

The presence of frogs is not common though we have known the yellow frog to live in the cabbages."

Figure 1.
The individual of *Litoria adelaidensis* that was transported to Christmas Island.

L. adelaidensis, despite its name, is restricted to the south—western corner of Western Australia, in areas of relatively high rainfall (above approximately 500mm *per annum);* it is usually found in vegetation bordering streams or swamps (Cogger 1979).

Should two or more individuals of this species reach the island, it is doubtful whether it would become established. There are no streams or swamps in the vicinity of the settlement, although there are some seepage streams on the opposite end of the island.

Questioning of local residents resulted in a few vague reports of small frogs (about 20mm) having been seen a long time ago in the vicinity of the settlement. No one had seen any frogs recently, and none the size of the adult *L. adelaidensis* had ever been observed.

It would appear that if frogs had ever become established on Christmas Island they became locally extinct again.

The present record indicates that *L. adelaidensis,* and presumably a number of other species as well, can survive the sea voyage under refrigeration. With continued high volume of commercial transport of fresh produce to the island, it is likely that more frogs, and other animals as well, will eventually arrive. It is possible that in time, species will arrive which could become established in the vicinity of the port.

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SOME OBSERVATIONS AND RECORDINGS OF REPTILES IN THE NORTHERN COASTAL BAY OF PLENTY.

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INTRODUCTION:

The author, over the last ten years has made many observations centering on Waihi, northwards to Pauanui (Lat. 37°01′ S, Long. 175°52′ E) and southwards to Papamoa Beach (Lat. 37°43′ S, Long, 176°21′ E). This material is from personal observations and from information gained from written material, other herpetologists and members of the public.

The region consists of a coastal plain, starting at Waihi (37° 24′ S, 75°51 E) and widening to the south. This is backed by the Coromandel Range north of Waihi and the Kaimai Range southwards, the central mountains being over 500 metres.The coastline northwards of Waihi is rugged and southwards sandy. In Pre-european times the hills were covered by the northern Podocarp/mixed hardwood forest (with Kauri). The coastal regions are typical New Zealand scrubland/fernland, dominated by manuka(*Leptospermum).* The rocky coastline has typical coastal vegetation of Pohutukawas (*Metrosideros excelsa),*Tuapata *(Coprosma)* and Flax *(Phormium).* Today most of the area is in pasture. South of Waihi, forest remains only on the higher hills, but northwards, where the country is more rugged, much forest remains, down to the coastline, and many gullies contain *Leptospermum* scrub.

FIGURE 1

GEKKONIDAE:

Hoplodactylus granulatus (Forest Gecko)

This species is found throughout New Zealand. Only three or four specimens have been caught in this area in the last few years although it is probably more common than this, especially in the remaining forest.

Hoplodactylus pacificus (Hauraki Gulf Gecko)

This gecko is confined to the North Island and offshore islets, as far south as Palmerston North (Lat. 40°10′ S). I have seen only one specimen from this area which was caught while clearing mixed native forest on a farm near Waitawheta (Lat.37°27′ S, 175°46′ E).

Hoplodactylus maculatus (Common Brown Gecko)

Another species that has a distribution throughout New Zealand. I have only collected this species from Ohui (37°05′ S,175°53′ E), under rocks above high tide. It probably isn't very common in the area, because of lack of suitable habitat (except coastal).

Naultinus elegans (North Island Green Gecko)

This genus is found throughout the North Island except the far North. The species is quite widespread in this area and common in places. It probably has benefited from the clearing of the forest and the regeneration of *Leptospermum* scrub, a favourite habitat.

SCINCIDAE:

Cyclodina aenea (Copper Skink)

A very common species in the North Island, being fairly secretive and preferring edges of forest and urban areas. It appears common throughout the area. At Ohui they were in coastal vegetation above high tide.

Leiolopisma moco

An interesting species, almost exclusively confined to islands on the East Coast, the southern-most being Karewa Island (36°58′ S,176°08′ E). Hardy (1977) records the only mainland colony as Tauranga (37′ 43′ S,176°10′ E). However, I have received specimens from three localities around Waihi, and they used to be common at Whangamata (37°13′ S,175°53′ E) behind the foreshore.

Leiolopisma smithi (Short-tailed Skink)

This skink is common, found almost exclusively along the littoral fringe on the East Coast as far south as Gisborne (38°40′ S,178°35′ E). On much of the rocky coast north of Waihi there are substantial colonies. Southwards, there are smaller colonies on the sandy beaches.

Leiolopisma suteri (Oviparous Skink)

This species is strictly littoral with the southernmost limit usually being considered as the Alderman Islands (36°58′ S,176°05′ E). However, in Sharrell (1975), Whitaker comments in the addendum that "recent reports indicate this skink is found ....to Whangamata on the East Coast of the Coromandel Peninsula." Though I have hunted extensively for this species, I have seen no specimens.

ISLANDS:

Slipper Island Group

Towns (1974), made a note on the lizards from the three islands in the group. From Slipper Island he recorded only *L.smithi,*but personal observations have also located *H.maculatus* on the seaward cliffs. The other two islands; Penguin and Rabbit, both have *L.smithi* and a further species of Brown Gecko, *Hoplodactylus duvauceli* (Duvaucel's Gecko). This species is only found on the islands in Cook Strait and those off the northern East Coast. These islands lie off the East Coast of Ohui, approximately 5kms offshore

Whangamata Islands

This group consists of four relatively undisturbed islands, the closest and largest, Clark Island, only 100 metres offshore. Rod Rowlands (pers. comm.) found a slough on this island, which apparently came from *H. granulatus.* There seem to be no other reports of lizards on this island. There is however, a small colony of Tuataras *Sphenodon punctatus,*on the far end. On Whenuakura Island there are large colonies of both *L. moco* and *S. punctatus,* apparently on either side of the island.

Karewa Island

A fairly unmodified island, it lies 7 kms off Matakana Island which guards Tauranga Harbour. There is a substantial *S.punctatus* colony. I have found no records of geckos and little on skinks though *C.aenea* and *L. moco* are both recorded in literature (Hardy 1977).

Mayor Island

Of recent volcanic origion, Mayor Island lies 27km from the shore. Hard (1954) recorded two species of lizards, *H. maculatus* and *L. moco.* Tuataras (*S. punctatus)* are rare and apparently confined to one small area, though a colony of reasonable size does exist on an islet. It has been rumoured that *N. elegans* also occurs.

NOTES

One species that is prominent by its absence is *Cyclodina ornata.* Hardy (1977) also pointed out the absence of this species on the Bay of Plenty Islands. It is found northwards on the Great Barrier Island, which has geological connections with the Coromandel Peninsula, though the peninsula does not seem to contain this species either.

The skink composition belongs to Hardy's northern group. This area corresponds to both the southern limits of *L. suteri* and *L. moco. Leiolopisma oliveri* also has its southern limit further north, on the Alderman Islands. The other common species of *Leiolopisma* in this group is *L. smithi,* and this occurs right around East Cape. The modified nature of the area as a whole seems to have had some influence on the reptile composition since Pre-european times, in particular a decrease in numbers and distribution of several species, especially the various *Hoplodactylus* species.

ACKNOWLEDGMENTS

I would like to thank the various members of the N.Z.H.S. who have given me valuable information as well as accompanying me on collecting expeditions, in particular Mrs. M. Firth and Mark Vickers.

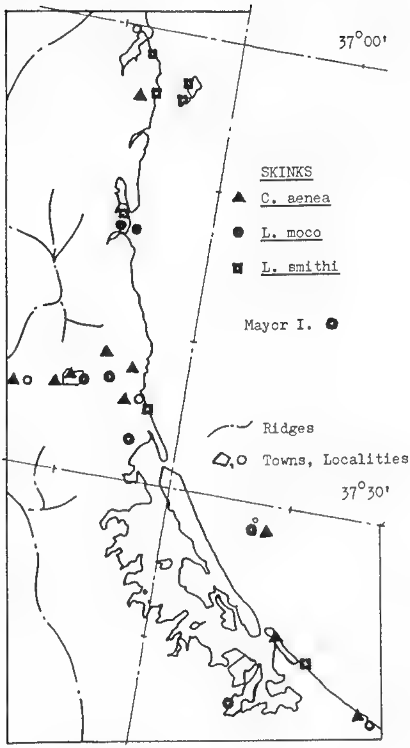

FIGURE 2a.

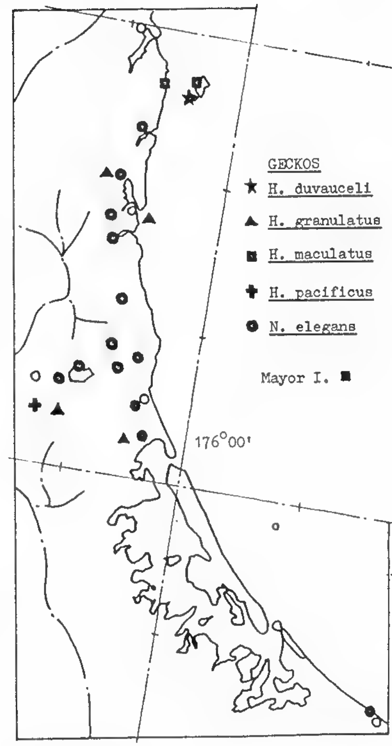

FIGURE 2b.

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EGGS AND YOUNG OF *PSEUDONAJA TEXTILIS TEXTILIS*

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Limited information is available dealing with the reproduction of the Eastern Brown Snake, *Pseudonaja textilis.* Some data has been provided on clutch sizes but records of incubation periods as well as the description of neonates are either vague or entirely absent from the literature. Accordingly the following note may be of interest.

On the 12th November, 1979 the author collected a small adult female of this species (SV: 1100mm) at Horsley Park, N.S.W. (Lat. 33°50' S., Long. 150°53' E). Although not noticeably gravid at the time of collection, the specimen eventually laid a clutch of 11 eggs under captive conditions.

Prior to egg-laying, the female was maintained in an all glass enclosure 0.5× 1.0m × 1.0m high, simplistically arranged with sheets of paper on the floor and a small cardboard box for concealment. On the 26th December, an underdeveloped "egg" was found in the enclosure, having been deposited within 48 hours of discovery. No further egg-laying took place until the evening of 9th January, 1980, when a clutch of 11 chalk-white eggs were deposited. Laying took place between 2245 hours on the 9th January and 0700 hours on the 10th January, all eggs appearing to be without defects. The eggs did not adhere together, being easily separable.

Kinghorn (1956), Worrell (1963) and Gow (1976) all record 20-30 eggs as composing the "average" clutch for this species. Waite (1898) cited an approximation of 20 and extreme ranges were given by McPhee (1959) with 10-35, Barrett (1950) 15-30, and Frauca(1966) who cites "upwards of 35". Although none of these records correlate clutch size with female length, it is possible that the small clutch size of 11 reported here (exclusive of the rejected underdeveloped "egg" of 26/12) is a consequence of the small size of the female. Worrell (1963) states that mating occurs in October-November and egg-laying in December-January; This appears to be in accordance with the observations reported, thus discounting a possibility that some laying may have preceded collecting.

After laying, the eggs were placed in a small box, covered with moistened paper and heated with the element from an electric blanket. At approximately 2 weeks development, the eggs were transfered to a plastic container of peat moss (moistened), being completely covered by the moss during the remainder of the incubation. Temperatures were not recorded during the incubation but the room in which the eggs were kept had an approximate daily range of 24-30°C.

Hatching occurred on the 24th March, 1980 (74 days after laying) when seven specimens emerged (see fig. 1). Emergence slits were made around the following times (E.S.T.): 0930 (2), 1000 (2), 1035 (2), and 1100-1330 (1). Another juvenile began to hatch the following day (25/3/80) between 0100-0600 hours. The remaining 3 eggs were found to be infertile.

After slitting the eggs, the juveniles remained within the egg cases for periods lasting 4 to 8 hours, with only the head exposed. Occasional inspections by the author would result in rapid withdrawal into the cases for a few minutes before re-exposure. Campbell (1973) stated that the emergence time for the North American "elapid" -*Micrurus fulvius tenere* (Eastern Coral Snake) was "approximately 4 hours". The Indian Cobra, *Naja naja* has been observed taking days to emerge completely, it being rare for the species to leave the egg case the same day as it is slit. (Campbell and Quinn, 1975), Charles, Whitaker and Shine, (1979) cite an instance where juveniles of the Spotted Black Snake, *Pseudechis guttatus* remained within their egg cases 24 hours after emergence slits were made. Campbell and Quinn (1975) consider that the slow emergence times of oviparous snakes is a consequence of acclimatisation, to the post-natal environment. However, one of

the above mentioned juvenile *P. textilis* was removed from its egg case soon after the emergence slit was discovered. Several centimetres of the umbilical and the remnants of the yolk sac were still attached to the venter. This gradually retracted into the body-cavity over the next three hours, the specimen being contained within a plastic bag, moistened with distilled water during the process. It would seem from this, that the completion of such a tissue regression progress might be facilitated by the actual slitting of the egg with partial emergence (head only), and that such lengthy delays in actual emergence are a necessary consequence. Whether this was typical of the entire clutch and/or an artifact of unnatural incubation could not be ascertained.

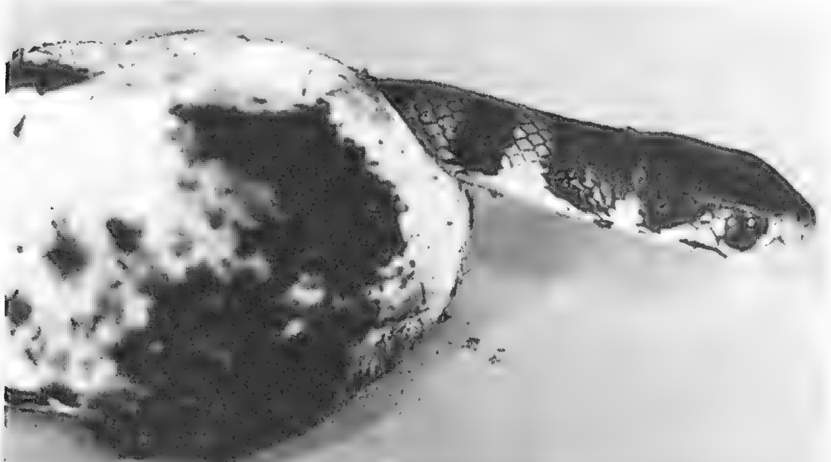
The juveniles were measured to the nearest 5mm; Snout-vent range 195-250mm (× 230); tail range 40-50mm (× 45). Mass was determined to 0.01g with a Sauter electronic balance, ranging from 4.71 to 7.20g (× 6.10).

Colouration and patterning was that typical of juveniles from the wetter Eastern part of the species' range all being strongly banded with black on tan-brown, a black nape and head as depicted in pl. 176 of Cogger (1975) and pl. 31 of Gow (1976).

Brief observations were made of the juveniles' responses to approaching objects, firstly a hand, then a pencil. Of the 8 specimens only one displayed extreme defence behaviour and this to the approach of a hand (palm). Such behaviour consisted of rapid tongue-flicking with simultaneous raising of head and neck, the latter retracted into the tight "S" shape accompanied by forced air-expulsion with the obvious expansion and contraction of body. Opening of mouth was followed by lunging toward the object. The specimen repeated the sequence a few times then, apparently fatigued, resorted to thrashing around the enclosure, with occasional lunges at the object as it approached. This defensive behaviour was elicited within 15 minutes of emergence from the egg case. The other seven juveniles did not resort to the same behavioural sequence when similarly disturbed, merely thrashing around the enclosure in a very excited state but not attempting to bite. All seemed to react indifferently to the approach of a pencil until it was within a couple of centimetres, whereupon some exploratory tonque flicking was elicited.

The time difference between the two stimuli was about 45 to 50 hours. A correlation between the size of moving stimuli and the defensive/predatory responses of juveniles cannot be determined from the above, but it might be worthy of more detailed analysis.

Figure 1.



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NOTES ON ECDYSIS IN *TILIQUA RUGOSA* (GRAY)

Glenn Shea, 13 Residence, Rozelle Hospital, Rozelle, N.S.W., 2039.

The few published records of the frequency of shedding in captive *Tiliqua rugosa* seem to differ greatly from the meagre details known of shedding in wild populations. Observations made on captive specimens in my collection seem to offer an explanation for this discrepency.

Six adult specimens of *T. rugosa* are housed in a 1.2×0.9m open topped hardboard enclosure, in a thermostatically—controlled heated room. Additional heating is supplied by two 100W incandescent globes, mounted about 30cm above the substrate. Photoperiod is 12hr L: 12hr D. This results in an diurnal temperature of 27—35°C between October and April. No free water is available in the cage, but large quantities of banana and commercial tinned cat food are fed. These seem to provide adequate water, as no visible signs of dehydration have been noted.

During the period November 1979 to April 1980, three specimens shed once, two twice, and one specimen did not shed. No further sheddings are expected, due to the specimens undergoing hibernation. Similar frequencies were noted in earlier years. Shedding took from 20mins to 3 days to complete. One specimen was observed during shedding (15/3/80: 10.00a.m.) to bend around 3 times and grasp a large portion of the shed skin in its mouth, apparently pulling the shed from the hind end of its body and left hind leg, then removing the entire shed from the right hind leg, to which it was still attached. Shedding in this instance took about 30mins. This behaviour could not be due to a lack of rough surfaces in the cage, as it took place in the middle of a large leafy dried *Melaleuca* branch on the cage floor, with a large angular granite boulder near by. Similar removal of shed skin by tearing off flakes with the jaws has been reported in geckos by Carr (1968: p.26)and Bellairs (1969: p. 289).

In most cases, the skin was shed as a single large piece covering much of the body, tail and head, with several small pieces covering areas of the abdomen, the feet and some labial scales. In all cases, the underlying epidermis was very damp for a short period after shedding.

The observed frequency of shedding in this study tends to support the observations of Warburg (1965) and Bull (1978), which indicate that wild *T. rugosa* shed only once per year, in late summer. Patience (1972) records shedding twice a year in a captive specimen given the run of the house, while Davey (1944) notes that *T. rugosa* shed annually, this observation presumably being on captive specimens. However, captive records by Fischer (1882) and Edwards (1962) give 6 and 4—5 sheds per year respectively. In the latter two cases, quantities of free water were available in the cage, and specimens were observed to soak in the water for some time prior to shedding. Sadlier (1958) records 8 specimens on Rottnest Island drinking from rainwater puddles on a bitumen road after a dry period of 93 days. The majority of these were either shedding, or showed signs of having just shed. Simpson (1973) notes an increase after rain in numbers of *T. rugosa* seen, many specimens drinking from puddles, while Reidy (1977) notes numbers of *T. rugosa* appearing after rain at Wilcannia.

Hay (1975) records shedding times of 30 mins and 4 days for two captive specimens

One explanation for the variation in the shedding frequency may be that wild populations, experiencing semi—arid to arid conditions, shed only once per year to conserve water, lost through the shedding process. My captive specimens, in dry conditions, similarly shed infrequently. During times when water is plentiful, such as during rain, conservation of water is of less importance, and the skin may be shed without unduly affecting the water balance of the lizard. Captive specimens given access to water are similarly able to shed more frequently

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OBSERVATIONS OF *CROCODYLUS POROSUS* IN THE NORTHERN GREAT BARRIER REEF.

Colin J. Limpus, Queensland National Parks and Wildlife Service, Townsville, 4180.

On the 3rd December 1977 an immature estuarine crocodile, *Crocodylus porosus,* (snout-vent length=67.7cm, total length 135.1cm) was caught on Raine Island (144°01′ E, 11°36′ S) at night in the shallows near the beach. When first sighted it was on the waters edge within several metres of a flock of brown gannets,*Sula leucogaster,* roosting on the beach. It is unlikely that this crocodile was stalking such large prey. The ghost crab *Ocypoda ceratophthalmus,* which was at a density of about one per metre of waterline, would seem a more suitable sized prey. On capture the crocodile's stomach was empty. After being tagged with a standard 7 gm monel metal turtle tag (no.X10004) into the left hind foot, the crocodile was released onto the reef flat the following day. Fresh tracks from the crocodile were found on the beach on the 6th December 1977 and it was spotlighted on the reef flat about 50m from the island at about midnight on the 7th December 1977.

No evidence of crocodiles was found on Raine Island during three other visits by the author: March1975, December 1976 and December 1978. However recent crocodile tracks, presumed *C. porosus,* were found on two inner shelf coral cays in the Raine Island area.

Bird Island (143°05′ E, 11°46′ S): 8th December 1976, two sets of tracks across the beach to an isolated shrub on the strand. One track very fresh. Length hind foot print= 16cm, estimated total length=180cm.

Milman Island (143°01′ E, 11°10′ S): 11th December1976, two sets of tracks across the beach. These tracks of similar size to those on Bird Island. Torres Strait Islanders on a crayfishing boat anchored near the island had seen the crocodile and estimated its size at 7ft (=213cm). They stated that crocodiles regularly inhabited the islands in the area.

6th December 1978, three sets of tracks radiating from an isolated shrub on the strand to the high tide mark, one very fresh. A fourth track on the other side of the island did not reach the vegetation. Length hind foot print =18cm. Estimated total =200cm.

Thus the occasional presence of crocodiles has been established for two out of nine islands of inner shelf area and one out of three islands of the outer barrier reef area examined in recent years by the author between Cape Grenville and Albany Passage. These immature estuarine crocodiles occurring at low level density on the coral cays of the northern Great Barrier Reef have probably dispersed from populations breeding in the small coastal streams and swamps of eastern Cape York Peninsula.

ACKNOWLEDGMENT: This research was funded in part by the Australian National Parks and Wildlife Service.

A NEW RECORD OF THE PYGMY MULGA MONITOR, *VARANUS GILLENI* (LUCAS AND FROST)

Steven Delean, 49 Davenport Tce, Seaview Downs. 5049. S.A.

Early in February, 1980, four members of the South Australian Junior Herpetology Group visited Uro Bluff (32°08′ S, 137°36′ E) which lies approximately 60km. north of Port Augusta.

The main aim of the trip was to obtain specimens of *Varanus gilleni*, (Pygmy Mulga Monitor) which we believed to inhabit the area, although they had never been recorded despite several trips by the S.A.H.G.

Uro Bluff is very rocky and mainly covered with Saltbush, Bluebush and Spinefex. Desert Sheoaks *(Casuarina stricta)* also cover large areas on the slopes.

The first specimen of *Varanus gilleni* was found on February 1st., in the hollow of a dead *Casuarina*. The specimen was active inside the tree and the scratching noises it made prompted us to investigate and eventually catch the goanna.

Two more specimens were caught the following day in a small *Casuarina* on the top of the Bluff. These were both inactive and although found in the same tree, were hiding in separate branches.

Further searches for this goanna proved unsuccessful although we did find many *Heteronotia binoei*, (Bynoe's Gecko) *Diplodactylus intermedius* (Eastern Spiny-Tailed Gecko) and *Cryptoblepharus plagiocephalus* in the dead trees— these lizards probably form a large part of the diet of *Varanus gilleni* in this area.

Acknowledgments:

I would like to thank Mark Francis and Chris Harvey for helping with this Herp Note.

UNUSUAL FOOD INTAKE OF A DIAMOND PYTHON

Jim Stopford, 37 Roebuck Crescent, Wilmont, N.S.W. 2770.

On 5th April, 1980 I was given a Diamond Python *(Morelia s. spilotes)* which had just been removed from an old house at St. Albans, NSW. The snake which was approximately 2 metres in length and in excellent condition, was placed in a linen bag.

Later the same day when the animal was removed from the bag it was found that the stomach contents had been regurgitated.

Closer inspection showed that the regurgitated "meal" consisted of:-

— A terry towling tea towel approximately 45cm × 75cm.
— Two lengths of sash cord each approximately 1m long.
— The cellophane wrapping from a cigarette packet.
— Two pieces of brown paper and a piece of newspaper.
— Half a plastic bag.
— Four rat droppings.

On examining the animal, I found a splinter of wood and several pieces of gravel lodged in the mouth. These were removed.

There was no evidence of a rat (apart from faeces) in this material. Did the snake strike at a rat and end up consuming the nest instead, or did it eat the nest because it tasted of rat?

CARRION DIET IN THE LACE MONITOR *VARANUS VARIUS*

Kim Kennerson, 46 Berith Road, South Wentworthville. N.S.W. 2145

On the first day of October 1979, I caught an adult male Lace Monitor *Varanus varius* (approximate snout to vent length 90cm).

It was caught at Kenebri (Lat. 30°45′ , Long. 149°02′) North West N.S.W.

The following day the monitor regurgitated what appeared to be the remains of a mammal.

Upon later examination of the regurgitated material I found hair, flesh, teeth, bone and toenails.

The remains were identified as those of an adult Grey Kangaroo or Forester *(Macropus giganteus).* This indicates that the Lace Monitors include in their diet tissues taken from the carcasses of dead kangaroos.

Tissues from the head and foot which on the intact carcass are firmly attached, could not be removed easily by scavenging Lace Monitors.

It is possible this monitor could have scavenged a road killed kangaroo which was partly fragmented in collision.

Acknowledgments
Prof. Jeff Sharman for identification of the regurgitated material.
Harry Ehmann for criticism of the note.

UNUSUAL BURROWING BEHAVIOUR IN *PYGOPUS LEPIDOPODUS*

Grant Husband

During May, 1975 I happened to observe one of my captive *P. lepidopodus* (Common Scaly Foot) excavating a burrow in the soil of its enclosure. The manner in which the burrow was constructed was most interesting.

When initially observed, the specimen (SV: 71mm, VT: 372mm) had already dug some 50mm into the muddy soil (due to recent rain). I was most surprised to see the specimen remove the soil from the "tunnel"in its mouth, and dispose of each mouthful a few centimetres from the entrance to the excavation! Immediately following the disposal of each mouthful of soil, the specimen proceeded to clean its labials and eyes with its tongue before returning for another mouthful of soil. After every 3—4 mouthfuls, the lizard would vigorously twist its body in the tunnel in a circular fashion and in so doing widen the tunnel. The temperature was 22°C.

Mr. Greg Sinclair who has also kept this species has since informed me that he has observed similar burrowing behaviour in one of his adult specimens.

A NOTE ON EGGLAYING BY *HEMIDACTYLUS FRENATUS* (HOUSE GECKO) IN DARWIN

Grant Husband.

At approximately 1900 (CST) on the 15th March 1980 a gravid female of this species (SV: 50mm Tail: 55mm) was secured by the author at Nightcliffe, a suburb of Darwin, N.T.

Four days later, on the 19th March, two calcarous-shelled eggs were laid. They were placed in a small plastic container and left undisturbed. Thirty-nine days after laying one egg was broken by the author to assess development,if any. A fully-formed juvenile apparently only days from hatching was discovered, but it died a few hours later. The second egg hatched on the 3rd May (45 days after laying).

Measurements of juveniles
1) SV: 19mm; VT; 17mm
2) SV: 19mm; VT: 20mm

DIURNAL PERCHING BY THE SOUTHERN SPINY – TAILED GECKO, *DIPLODACTYLUS INTERMEDIUS*

Harry Ehmann, School of Biological Sciences, Sydney Technical College, Broadway. 2077

The Southern Spiny—tailed Gecko is frequently found active on the ground during warm nights while spotlighting. It can also be found by day in the shelter of cavities amongst small to medium sized stone aggregations on sandy loam soils, under fallen natural timber, discarded iron sheeting and wood, in *Triodia* bushes or in disused animal burrows.

To date I have found three specimens perched on low horizontal branches (to 25cm from the ground) of the Bluebushes *(Kochia pyramidata* and *K. sedifolia,* CHENOPODIACEAE) during the day in 3 localities within 50km of Port Augusta in South Australia.

Each occasion was a warm spring or summer's day and there were no obvious shelter sites of the type mentioned above in the vicinity. The lizards were lying parallel with and on top of the horizontal branches (between 12 and 20mm in diameter), with the tail extended and relaxed and the head also resting on the branch. They were well camouflaged, their body and iris colour patterning all matching the dusty grey colour and rough texture of the bark.

None of the three perchings were in full sunlight, but one of them would have had to move in the afternoon to avoid direct sun. Another was in a site that had direct mid—morning sun.

When disturbed by my slowly approaching hand one of the geckos reared back, gaped its mouth widely for what seemed a long time (perhaps 1 to 3 seconds), at the same time emitting a drawn out rattling squeak. I did not move my hand, it closed its mouth and leapt from the branch onto the ground below and ran very quickly towards the basal convergence of the branches.

Another of the perching geckos attempted to slowly and smoothly back down along the branch without the above described display, when my hand approached. The third made no move at all.

To date I have also found five specimens in small non—extensive crevices and holes within 30cm of the ground. Each could only just accomodate one lizard and all five specimens were spring or summer finds.

The species appears to be only marginally arboreal as described above. Of the thirty or so specimens I have observed in the field (in S,A., N.T., and Western NSW) most (if not all) were in habitat that included chenopodiaceous shrubs of the genera *Kochia* and *Atriplex.* It is sympatric over much of its range with the Dtellas,*Gehyra spp* and these species appear to utilise the arid and semi—arid arboreal and rock crevice habitats much more successfully than the Southern Spiny—tailed Gecko. Perhaps "shruboreal" might be a better descriptive term for their off—ground activities.

Further field or captive observations might determine whether this species "ambush" hunts insects and spiders by day.

I thank Peter Mirtshin whose two earlier sightings of perching behaviour by Southern Spiny—tailed Geckos led to my own observations.

REGIONAL NEWS

With this issue's change in printing and paper the regular Editorial and Hisses and Croaks of the past issues give way to a shorter combined Regional News feature. Important Australasian issues in the future may warrant a Special Editorial.

The Affiliation

The resolutions of the third Convention in Melbourne included:-

1. to further improve *Herpetofauna* (with a moderate price increase)
2. to press ahead with the development of the Australasian Herpetologist's Manual (see below)
3. to support and aid the establishment of further autonomous herpetological societies at the city, district and state level and
3. to hold the next Convention in New Zealand in late October 1981.

Herpetofauna improvements evident in this issue have involved much effort. We are very finely tuned financially, and to keep this quality we must develop a wider distribution. Affiliated Societies must look to increasing their memberships, and each individual subscriber must recruit at least one new subscriber. Please play your part to increase our distribution from 700 to 1000.

The V.H.S. has undertaken the enormous task of compiling the Australasian Herpetologist's Manual. Conceived as a keeper's manual it will now include additional material of a practical nature. Affiliated Societies will soon receive their outlines and proposals. It is a bold, worthy, long-term undertaking deserving everyone's full support.

The fourth convention in New Zealand is now being planned. Details about itinerary, group bookings, costs etc will soon be available from your society secretary or the convenor.

In *South Australia* the SAHG is utilizing part of a grant received from the Department of Environment to carry out a survey of the Simpson Desert in September. Other surveys in the South East of the State will be made towards the end of 1980 and early 1981.

Several members have devoted considerable time and effort in constructing resources to assist the group in giving lectures and displays. As well the SAHG trailer has been rebuilt.

The Junior Group continues to be very active and have made a trip to Joe Bredl's Reptile Park and undertaken a display at a local primary school.

In *Victoria* protective legislation came into force on the 1st June although there is a three months amnesty period to the 31st August. The regulations cover only Victorian species and further regulations and permits to cover interstate reptiles already held in captivity are still uncertain.

Extensive field work will be undertaken this year with the election of Greg Fyfe and Peter Booth to the Committee. They are already working on a survey project, of the reptiles and amphibians of the Melbourne suburbs which will involve most members.

The recent A.A.H.S. Convention was very well attended and it gave members the opportunity to meet so many of the people that we have corresponded with in the past. The V.H.S. has started work on the "Australasian Herpetologist's Manual" and this will be one of our main projects for the next year.

At the time of writing, protective legislation for *New Zealand's* lizard species had not yet been enacted, but by all accounts this is very close.

The NZHS plans to combine forces with other groups for joint studies. We may soon be doing joint studies with the Entomological Society of New Zealand to determine the food insects of our lizards

We have in the past 6 months established a good understanding with the Wildlife Authorities largely as a result of contacts made at the Herpetological Symposium in Wellington.

For the coming months we aim to increase our public education, display and advertising roles. We also plan some research and publishing of handbooks and information leaflets.

From *Queensland* the good news is that the North Queensland Herpetological Society is going from strength to strength. Incidently there was a misprint in the last *Herpetofauna* - The NQHS membership fee is zero dollars. not $10. The selling of cane toads is indeed a novel way of raising society funds.

The Affiliation wishes NQHS herpetological happiness!

In *New South Wales* the AHS recently held (in conjunction with the Trust) an exhibition of reptiles and frogs at the Lane Cove River Park. 7,000 people saw the free exhibition. A donation box for the Peter Rankin Trust Fund was also installed.

In September we will have an exhibition of reptiles at the annual Wisteria Fete at Parramatta. We hope to raise urgently needed funds and we're optimistic - last year about 100,000 people visited the Fete.

The planned October long weekend trip by bus to the Macquarie Marshes has now been confirmed.

Our Newsletter has proved very popular with the members and we plan to increase its size and include photographs.

The affiliation has recently received several requests from overseas Herpetological organisations to exchange publications. As some readers may be interested in taking out membership in these groups, we are publishing brief details.

The Herpetological Association of Africa.

The Herpetological Association of Africa is 15 years old but can trace its geneology back a further 7 years to the birth of its parent Society - The Herpetological Association of Rhodesia. During this period the Association's Journal has been, and remains, the only publication dealing specifically with African herpetology.

The Journal (2-3 issues per year) is well illustrated and caters for both the professional and amateur herpetologist. Membership to the Association is open to all interested persons (Subscriptions U.S. $6.00) and details can be obtained from the Secretary:-

Dr, W.R. Branch,
Curator of Herpetology,
Port Elizabeth Museum,
P.O. Box 13147,
HUMEWOOD. 6013
SOUTH AFRICA.

International Herpetological Society

The International Herpetological Society is the largest U.K. amateur herpetological society and issues a monthly newsletter and a society journal "The Herptile" which is published quarterly. Current subscription rate is stg. £5.00 for overseas members and details may be obtained from the Secretary:-

Mr. A.J. Mobbs,
27 St. Thomas Close,
Dartmouth Avenue,
Walsall
West Midlands WS3 ISZ
ENGLAND.

The Dutch Turtle and Tortoise Foundation

The Dutch Turtle and Tortoise Foundation was founded in 1979 to contribute to the conservation of turtles, tortoises and terrapins, to provide information on these animals, to stimulate captive breeding, and to promote closer contact between chelonophiles, scientists and institutions.

The Foundation publishes "Chelonologica" a bi-monthly journal. Other publications are reprinted articles from "Chelonologica", information leaflets, loose-leaf systems, reprinted books and journals, special publications and transactions. Further information can be obtained from:-

The Secretary,
D.T.T.F.
P.O. Box 125,
8700 AC Bolsward
THE NETHERLANDS.

NOTES TO CONTRIBUTORS.

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